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## ULYSSES

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Project Mgr: W. Meeks  
MOM: P. Beech (ESOC)  
LV/Range: STS-IUS-PAM-S/ETR

Launch Date: October 6, 1990

Projected SC Life/DSN Support: 8 years/5 years

Project Responsibility: Jet Propulsion Laboratory (JPL)/European Space Agency (ESA)

Source: SIRD December 1983

Sponsor: ESA/NASA

Program Manager: R. Murray

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### A. MISSION DESCRIPTION

The primary objectives of Ulysses are to extend scientific knowledge and understanding through exploration of the Sun and its environment, and to investigate possible mechanisms coupling solar variability to terrestrial weather and climate by studying the Sun's structure and emission as a function of latitude from the solar equator to the solar poles.

### B. FLIGHT PROFILE

Ulysses consists of a single European Space Agency (ESA) spacecraft. The spacecraft will be launched in 1990 from Kennedy Space Center (KSC) by a Space Transportation System (STS) vehicle using an Inertial Upper Stage (IUS) and a Propulsion Assist Module (PAM-S) to inject the spacecraft into an interplanetary orbit toward Jupiter. After Jupiter flyby, the spacecraft travels

in a heliocentric, out-of-ecliptic orbit with high heliographic inclination. The mission terminates in September 1995 at the end of the second polar pass. The highest priority portion of the mission occurs when the spacecraft is greater than 70 degrees heliographic latitude during solar passes.

## C. COVERAGE

### 1. Coverage Goals

The antenna coverage profile provided below supports the Ulysses SIRD, JPL D-292, dated April 24, 1989. There have not been any additions or deletions to the SIRD since launch, October 1990. The requirements are expected to increase only when the project cannot obtain minimal support to retrieve data from its on-board tape recorder to complete daily 24-hour coverage throughout the prime mission phase.

The DSN expects to meet the coverage goals except when other spacecraft emergencies occur or in the case of other interruptions which are beyond the control of the DSN.

<u>Mission Phase</u>	<u>Period</u>	(30 days) <u>Passes/Month</u>	<u>Antennas</u>
Launch	10/5/90 - 10/23/90	6	26-m
(TCMs, S/C checkout, and science turn-on, calibrations)	90	34 STD	
DOR during overlaps only		8	70-m
L +41 to L +50		27	34 HEF
Routine	12/90	30	34 STD
First Opposition (70-m last week of Dec/ first week of Jan)	12/90 - 01/91	27	70-m
Routine	01/91 - 05/91	30	34 STD
First Conjunction	06/91 - 11/91	30	34 STD
	06/91	30	34 HEF
	07/91	30	70-m
	08/91	45	70-m
	09/91	30	70-m
Routine	12/91 - 01/92	30	34 STD

<u>Mission Phase</u>	<u>Period</u>	(30 days) <u>Passes/Month</u>	<u>Antennas</u>
Jupiter Flyby	02/92	90	34 STD
	02/92	30	70-m
Second Opposition	03/92	90	34 STD
Gravitational Wave			
Exp.	03/92	90	34 HEF
Routine	04/92 - 05/92	30	34 STD
Second Conjunction	06/91 - 08/92	13	34 STD
	06/92 - 08/92	17	70-m
	09/92	30	70-m
	10/92 - 11/92	13	34 STD
	10/92 - 11/92	17	70-m
Routine	12/92 - 02/93 (to mid Feb)	30	34 STD
Third Opposition	02/93 - 03/93	90	34 STD
Gravitational Wave	(from mid Feb)		
Exp.	02/93 - 03/93	90	34 HEF
Routine	04/93 - 05/94	30	34 STD
Solar Pass 1	06/94 - 08/94	30	34 STD
Routine	09/94 - 05/95	30	34 STD
Solar Pass 2	06/95 - 09/95	30	34 STD
EOM	10/95		

## 2. Network Support

The support provided by the DSN is indicated in the following table:

<u>System</u>	<u>Goldstone</u>				<u>Canberra</u>				<u>Madrid</u>			
	12	14	15	16	42	43	45	46	61	63	65	66
S-band TLM	P	P	*		P	P	*		P	P	*	
X-band TLM	P	P	P		P	P	P		P	P	P	

<u>System</u>	<u>Goldstone</u>	<u>Canberra</u>	<u>Madrid</u>
Cruise S-band CMD	P P *	P P *	P P *
S-band TRK	P P *	P P *	P P *
X-band TRK	P P	P P	P P

NOTES: P = Prime; \* = 26-m S-band support for initial acquisition or backup

During the first solar pass (May 1994 - October 1994) and the second solar pass (May 1995 - September 1995), the spacecraft will be in nearly continuous view of the southern hemisphere station, and then it will be in nearly continuous view of the northern hemisphere station.

<u>System</u>	<u>Goldstone</u>	<u>Canberra</u>	<u>Madrid</u>
	12 14 15 16	42 43 45 46	61 63 65 66
S/X-band TLM	P P P	P P P	P P P
Critical S-band CMD	P P	P P	P P
Events S/X-band TRK	P P	P P	P P

NOTE: P = Prime

### 3. Compatibility Testing

MIL 71 and the compatibility test van will support compatibility and other project re-tests beginning in April 1990.

### D. FREQUENCY ASSIGNMENTS

Frequencies are allocated according to the following table:

<u>System</u>	<u>Uplink (MHz)</u>	<u>Downlink (MHz)</u>	<u>Polarization</u>
S-band TLM	--	2293.148148	RCP
X-band TLM	--	8408.209876	RCP
S-band CMD	2111.607253	--	RCP
S-band TRK	2111.607253	2293.148148	RCP
X-band TRK	--	8408.209876	RCP

## E. SUPPORT PARAMETERS

The support parameters for the Telemetry, Command, and Support Systems are listed below:

## (1) Telemetry

Data Streams	1 (S- or X-band)
Format	PCM(NRZ-L)/PSK/PM
Subcarrier Frequency	65.536 kHz for 64, 128, 256, 512,
Bit Rate	1024, 2048, 4096, 8192 b/s
Record	131.072 kHz for 2048 to 8192 b/s
	DODR required

## (2) Command

Format	PCM/PSK/PM
Bit Rate	15.6250 b/s
Subcarrier Frequency	16 kHz

## (3) Support

Uplink Power	Up to 20 kW (34-m), 100 kW (70-m)
Antenna Rate	Sidereal, except at launch
Antenna Angle Data	Not required
Antenna Autotrack	First pass (26-m, only)
Doppler Rates	Moderate, except first pass
Range Format	Standard DSN
Recording	
. Analog	Not required
. Digital	Required

## F. TRACKING SUPPORT RESPONSIBILITY

The allocation of responsibilities for tracking support is listed in the following table:

<u>Mission Phase</u>	<u>Support Responsibility</u>
STS Launch	TDRSS
IUS/PAM-S Injection	TDRSS/USAF
Cruise/Encounter/Solar Passes	DSN

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